UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/683,774	10/10/2003	Gail A. Alverson	324758001US5	1801

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/683,774	ALVERSON ET AL.
	Examiner	Art Unit	
	Michael Wilser	2195	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>26 September 2007</u>.

2a) ☒ This action is **FINAL**.   2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-66</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-66</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>26 September 2007</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>9/26/07 & 9/28/07</u>.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

1.   Claims 1-66 are pending in this application.

Claim Rejections - 35 USC § 103

2.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

3.   Claims 1-11, 15, 19-22, 34-44, 48, and 52-55 rejected under 35 U.S.C. 103(a) as

being unpatentable over Borkenhagen et al. (US 6,567,839) in view of Elliott et al. (US

5,768,352).

4.   As per Claim 1, Borkenhagen teaches the invention substantially as claimed

including a method in a computer system for placing a task in a known state, the task

having multiple threads executing on streams of a processor of the computer system,

the processor having multiple streams for simultaneously executing threads of the task

(abstract, lines 3-6 & column 15, lines 50-56) comprising:

a. thread switch manager to notify each of the threads of the task executing on a stream of the processor (column 8, lines 57-67); and

b. for each of the threads, in response to receiving the notification, entering the known state so that an action can be performed with the task being in the known state (column 8, lines 57-67).

5.   However, Borkenhagen does not explicitly disclose of notifying a task to enter a known state. However, Elliott discloses a method in which the threads executing are notified to enter a known state (column 9, lines 38-44).

6.   It would have been obvious to one of ordinary skill in the art at the time of invention to have notified the threads in Borkenhagen's invention using Elliott's method. One would have been motivated to notify the threads to enter a known state so that all threads related to a process were in the same state so that a function performed on them updates the entire task at once and doesn't cause data coherency problems.

7.   As per Claim 2, Borkenhagen further discloses that the known state is a quiescent state (column 14, lines 50-65).

8.   As per Claim 3, Borkenhagen further discloses that the known state is when the thread is executing idle instructions (column 23, lines 52-60).

9.   As per Claim 4, Borkenhagen further discloses that the known state is when threads stop executing instructions (column 23, line 1).

10.   As per Claim 5, Borkenhagen further discloses of assigning the task to a protection domain (processor) and raising a signal (flagging) the protection domain (column 8, lines 19-52).

11.   As per Claim 6, Borkenhagen further discloses that prior to entering the known state the thread saves its state (column 6, lines 13-16).

12.   As per Claim 7, Borkenhagen further discloses that the thread initiates the notifying (column 8, lines 57-67).

13.   As per Claim 8, Borkenhagen further discloses that the thread initiates the notifying by sending a request to the operating system (column 7, lines 51-60).

14.   As per Claim 9, Borkenhagen further discloses that the thread notifies the operating system that it is blocked from productive use before entering the known state (column 7, lines 51-60).

15.   As per Claim 10, Borkenhagen further discloses the tasks are swapped in and out of the processor (column 8, lines 57-67).

16.   As per Claim 11, Borkenhagen further discloses that before entering a known

state the thread saves its state information (column 13, lines 22-32).

17.   As per Claim 15, Borkenhagen further discloses that the action is to process a

signal by the operating system (column 9, lines 1-7).

18.   As per Claim 19, Borkenhagen further discloses that the known state includes

invoking an operating system call (column 7, lines 51-60).

19.   As per Claim 20, Borkenhagen further discloses that the thread notifies the

operating system of when the thread is in a known state (column 7, lines 51-60).

20.   As per Claim 21, Borkenhagen further discloses that when a thread is processing

a signal the other threads are n a quiescent state (column 14, lines 50-65).

21.   As per Claim 22, Borkenhagen further discloses that after processing the signals

each thread exits the known state (column 8, lines 57-67).

22.   As per Claims 34-44, they are rejected for the same reason as Claims 1-11

above.

23.   As per Claim 48, it is rejected for the same reason as Claim 15 above.

24.   As per Claims 52-55, they are rejected for the same reason as Claims 19-22

above.

25.   Claims 12-14 and 45-47 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Borkenhagen et al. (US 6,567,839) and Elliott et al. (US 5,768,352) a

applied to claims 1 and 34 above, and in further view of Alpert et al. (US 5,621,886).

26.   As per Claim 12, Borkenhagen and Elliott do not explicitly disclose of reviewing

the state information of each thread. However, Alpert discloses of a method and in

which the state information of each thread is reviewed (column 3, lines 6-29).

27.   It would have been obvious to one of ordinary skill in the art at the time of

invention to have reviewed the state information in Borkenhagen and Elliott's system.

One would have been motivated to review the state information to verify that the actions

the thread had taken before entering the known state were in line with the expected

results from the particular task.

28.   As per Claim 13, Alpert further discloses of reviewing the state information using

a debugger (column 3, lines 6-29).

29.   As per Claim 14, Alpert further discloses of the debugger executing threads of a

task that do not enter a known state column 2, lines 39-67 & column 3, lines 1-5).

30.   As per Claims 45-47, they are rejected for the same reason as Claims 12-14

above.

31.   Claims 16 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Borkenhagen et al. (US 6,567,839) and Elliott et al. (US 5,768,352) as applied in

Claims 1 and 34 above, and in further view of Potash (US 2002/0103847).

32.   As per Claim 16, Borkenhagen and Elliott do not explicitly disclose of performing

an inter-thread long jump. However, Potash discloses a method that does perform an

inter-thread jump (page 2, paragraph 12).

33.   It would have been obvious to one of ordinary skill in the art at the time of

invention to perform a thread jump in Borkenhagen and Elliott's system. One would

have been motivated to perform an inter-thread jump so that the processor could follow

the progression f the thread and jump ahead to continue processing if an error had

occurred.

34. As per Claim 49, it is rejected for the same reason as Claim 16 above.

35. Claims 17-18 and 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borkenhagen et al. (US 6,567,839) and Elliott et al. (US 5,768,352) as applied in claims 1 and 34 above, and in further view of Slingwine et al. (US 6,219,690).

36. As per Claim 17, Borkenhagen and Elliott do not explicitly disclose that the known state is waiting on a synchronization indication. However, Slingwine discloses a method in which the known state is waiting on a synchronization indication (column 2, lines 8-26).

37. It would have been obvious to one of ordinary skill in the art at the time of invention to have the known state in Borkenhagen and Elliott's invention be a synchronization indication. One would have been motivated to have the known state be a synchronization indication so that when the threads have been moved from a stopped or sleep state they can be resynchronized so that there are no error conditions or null conditions among the communicating threads.

38.   As per Claim 18, Slingwine further discloses that the waiting is performed by accessing memory location of future synchronization information (column 8, lines 49-53).

39.   As per Claims 50-51, they are rejected for the same reason as Claims 17-18 above.

40.   Claims 23-26 and 56-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borkenhagen et al. (US 6,567,839) in view of Elliott et al. (US 5,768,352) and applicants admitted prior art (AAPA).

41.   As per Claim 23, Borkenhagen teaches the invention substantially as claimed including a method in a computer system for a task to exit a known state, the computer system supporting multiple streams, the task having multiple threads executing on the streams (abstract, lines 3-6 & column 15, lines 50-56) comprising:

        a. notifying each of the threads of the tasks executing on a parallel processor architecture (column 8, lines 57-67); and

        b. for each thread, in response to receiving the notification, executing instructions that were to be executed (column 8, lines 57-67).

42.   However, Borkenhagen does not explicitly disclose of notifying a task to enter a

known state. However, Elliott discloses a method in which the threads executing are

notified to enter a known state (column 9, lines 38-44).

43.   It would have been obvious to one of ordinary skill in the art at the time of

invention to have notified the threads in Borkenhagen's invention using Elliott's method.

One would have been motivated to notify the threads to enter a known state so that all

threads related to a process were in the same state so that a function performed on

them updates the entire task at once and doesn't cause data coherency problems.

44.   However, Borkenhagen does not explicitly disclose of having multiple

simultaneously executing protection domains. However, the AAPA on page 3, line 1

discloses that it is known that the MTA processor supports as many as 16 active

protection domains.

45.   It would have been obvious to one of ordinary skill in the art at the time of

invention to have had multiple protection domains in Borkenhagen. One would have

been motivated to have multiple protection domains since processors in the computing

arts that can be used for multi threaded applications are known to have multiple

protection domains.

46.   As per Claim 24, Borkenhagen further discloses that the known state is a

quiescent state (column 14, lines 50-65).

47.   As per Claim 25, Borkenhagen further discloses that the known state is when the

thread is executing idle instructions (column 23, lines 52-60).

48.   As per Claim 26, Borkenhagen further discloses that the known state is when

threads stop executing instructions (column 23, line 1).

49.   As per Claims 56-59, they are rejected for the same reason as Claims 23-26

above.

50.   Claims 27-28 and 60-61 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Borkenhagen et al. (US 6,567,839), Elliott et al. (US 5,768,352), and

AAPA as applied to claims 23 and 56 above, and further in view of Slingwine et al. (US

6,219,690).

51.   As per Claim 27, Borkenhagen, Elliott, and AAPA do not explicitly disclose that

the known state is waiting on a synchronization indication. However, Slingwine

discloses a method in which the known state is waiting on a synchronization indication

(column 2, lines 8-26).

52.   It would have been obvious to one of ordinary skill in the art at the time of invention to have the known state in Borkenhagen, Elliott, and AAPA's invention be a synchronization indication. One would have been motivated to have the known state be a synchronization indication so that when the threads have been moved from a stopped or sleep state they can be resynchronized so that there are no error conditions or null conditions among the communicating threads.

53.   As per Claim 28, Slingwine further discloses that the notifying includes indicating the synchronization (column 8, lines 49-53).

54.   As per Claims 60-61, they are rejected for the same reason as Claims 27-28 above.

55.   Claims 29-31 and 62-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borkenhagen et al. (US 6,567,839), Elliott et al. (US 5,768,352), and AAPA as applied to claims 23 and 56 above, and further in view of Alpert et al. (US 5,621,886).

56.   As per Claim 29, Borkenhagen, Elliott, and AAPA do not explicitly disclose that the thread restores state information that was saved before entering the known state. However, Alpert discloses of a method in which the state information of a thread is later restored (column 3, lines 6-29).

57.   It would have been obvious to one having ordinary skill in the art at the time of invention to restore the saved state information in Borkenhagen, Elliott, and AAPA's system. One would have been motivate to restore the saved state information so that the thread could return to its previous executing place with access to its previous actions that it performed before entering the known state.

58.   As per Claim 30, Alpert further discloses that threads wait until signals are processed before executing instructions that were to be executed before entering the known state (column 8, lines 54-61).

59.   As per Claim 31, Alpert further discloses that threads wait until signals are processed before executing instructions that were to be executed before entering the known state (column 8, lines 54-61).

60.   As per Claims 62-64, they are rejected for the same reason as Claims 29-31 above.

61.   Claims 32-33 and 65-66 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Borkenhagen et al. (US 6,567,839), Elliott et al. (US 5,768,352), and

AAPA as applied to claims 23 and 56 above, and further in view of Shrote (US

5,774,358).

62.   As per Claim 32, Borkenhagen, Elliott, and AAPA do not explicitly disclose of

reserving a number of streams for the task. However, Shrote discloses of a method in

which streams are reserved for the task (column 12, lines 44-58).

63.   It would have been obvious to one of ordinary skill in the art at the time of

invention to have reserved streams for the task in Borkenhagen, Elliott, and AAPA's

system. One would have been motivated to reserve streams for the task so that once

the task has exited the known state it can renter the processor and continue processing.

64.   As per Claim 34, Shrote further discloses the tasks do create streams for the

threads (column 12, lines 44-58).

65.   As per Claims 65-66, they are rejected for the same reason as Claims 32-33

above.

Response to Arguments

66.   Applicant's arguments with respect to claims 1-66 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

67.   Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Wilser whose telephone number is (571) 270-1689. The examiner can normally be reached on Mon-Fri 7:30-5:00 EST (Alt Fridays Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MPW
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